9-24-1965

Test 913: John Deere 2510 Power-Shift Gas

NEBRASKA TRACTOR TEST 913 - JOHN DEERE 2510 POWER-SHIFT GASOLINE

POWER TAKE-OFF PERFORMANCE

	Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Temperature Degrees F Air wet bulb	Temperature Degrees F Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
*	49.57	2500	4.827	0.601	10.27	181	61	75	28.787
Standard Power Take-off Speed (1000 rpm)—One Hour									
	45.05	2066	4.193	0.574	10.74	182	62	76	28.770
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
	43.26	2566	4.601	0.656	9.40	176	62	76	.....
	0.00	2710	2.111	.....	.....	161	62	75	.....
	22.18	2631	3.395	0.944	6.53	168	62	75	.....
	49.41	2500	4.815	0.601	10.26	181	61	75	.....
	11.24	2672	2.768	1.519	4.06	164	62	75	.....
	32.90	2603	4.022	0.754	8.18	170	62	75	.....
Av	**26.50**	**2614**	**3.619**	**0.842**	**7.32**	**170**	**62**	**75**	**28.737**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool-ing med	Temp Degrees F Air wet bulb	Temp Degrees F Air dry bulb	Barom-eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
42.44	3533	4.50	2500	5.59	4.933	0.717	8.60	172	65	72	28.810
75% of Pull at Maximum Power—Ten Hours—4th Gear											
33.67	2665	4.74	2577	3.68	4.408	0.807	7.64	171	64	69	28.771
50% of Pull at Maximum Power—Two Hours—4th Gear											
23.33	1792	4.88	2622	2.49	3.864	1.022	6.04	169	60	61	28.660
MAXIMUM POWER WITH BALLAST											
33.26	6038	2.07	2556	14.73	2nd Gear			171	65	71	28.810
41.64	4588	3.40	2503	7.78	3rd Gear			172	65	70	28.860
42.68	3552	4.51	2500	5.56	4th Gear			171	65	70	28.830
40.33	2565	5.90	2497	3.93	5th Gear			170	65	71	28.830
38.57	1875	7.71	2502	3.09	6th Gear			171	65	71	28.830
38.26	1394	10.29	2504	2.38	7th Gear			170	65	71	28.830
MAXIMUM POWER WITHOUT BALLAST											
40.95	3445	4.46	2502	8.28	4th Gear			179	66	75	28.490

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds pull	3552	3760	3969	4160	4319	4335	4079
Horsepower	42.68	40.55	37.78	34.25	30.64	25.68	19.55
Crankshaft speed, rpm	2500	2252	1998	1735	1500	1253	1008
Miles per hour	4.51	4.04	3.57	3.09	2.66	2.22	1.80
Slip of drivers, %	5.56	5.96	6.49	6.75	7.26	7.14	6.49

TIRES, BALLAST and WEIGHT		**With Ballast**	**Without Ballast**
Rear tires	—No, size, ply & psi	Two 13.6-38; 6; 16	Two 13.6-38; 6; 14
Ballast	—Liquid	615 lb each	None
	Cast iron	145 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 28	Two 6.00-16; 6; 28
Ballast	—Liquid	None	None
	Cast iron	None	None
Height of drawbar		17½ inches	18½ inches
Static weight	—Rear	6080 lb	4560 lb
	Front	1790 lb	1840 lb
Total weight with operator		8045 lb	6575 lb

Department of Agricultural Engineering
Dates of Test: SEPTEMBER 24 TO SEPTEMBER 30, 1965
Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel regular gasoline **Octane No** Motor 85.2 Research 92.3 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.7410 **Weight per gallon** 6.168 lb **Oil** SAE 20-20W **API service classification** MS, DG **To motor** 1.427 gal **Drained from motor** 1.499 gal **Transmission and final-drive lubricant** John Deere Special 303 oil **Total time engine was operated** 43½ hours.

ENGINE Make John Deere gasoline **Type** 4 cylinder vertical **Serial No** SNM51RAO12735T **Crankshaft mounted** lengthwise **Rated rpm** 2500 **Bore and stroke** 3.86" x 3.86" **Compression ratio** 7.5 to 1 **Displacement** 180.43 cu in **Carburetor size** 1" **Ignition system** battery **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** dry type with replaceable paper element **Oil filter** replaceable pleated paper cartridge **Oil cooler** radiator for transmission and hydraulic oil **Fuel filter** screen in carburetor and fuel pump **Muffler** was used **Cooling medium temperature control** thermostat.

CHASSIS Type tricycle **Serial No** SNT711-P001012R **Tread width** rear 57" to 91" front 8¾" or 18½" **Wheel base** 90" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 25.7" Vertical distance above roadway 34.4" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with operator controlled full range power shifting **Advertised speeds mph** first 1.67 second 2.36 third 3.67 fourth 4.75 fifth 6.12 sixth 7.92 seventh 10.49 eighth 17.49 reverse (at 2100 rpm) first 1.63 second 2.31 third 3.60 fourth 4.66 **Clutch** multiple disc wet clutches within transmission hydraulically operated **Brakes** wet disc hydraulically power actuated operated by two foot pedals which can be locked togteher **Steering** hydraulic with power assist **Turning radius** (on concrete surface with brake applied) right 103½" left 103½" (on concrete surface without brake) right 125" left 125" **Turning space diameter** (on concrete surface with brake applied) right 243½" left 243½" (on concrete surface without brake) right 287" left 287" **Belt pulley** 976 rpm at 2100 engine rpm diam 12" face 8½" Belt speed 3063 fpm **Power take-off** 547 or 1016 rpm at 2100 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run as it exceeded 15 mph.

The normal procedure used to determine oil consumption during official test gave questionable results on this engine. An anti-drain feature incorporated within the oil filter cartridge did not function consistently.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 913.

L. F. LARSEN
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
J. J. SULEK D. E. LANE
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representaitve makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

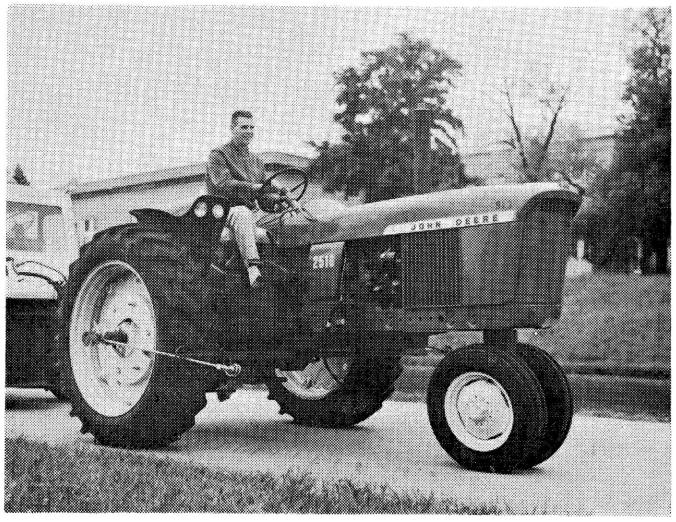
Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**



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